EERC
Energy & Environmental Research Center
Putting Research Into Practice

PCO2R Partnership
Plains CO_2 Reduction (PCOR) Partnership

Fact Sheet

Practical, Environmentally Sound CO_2 Sequestration

Bell Creek Integrated CO_2 EOR and Storage Project

Injecting carbon dioxide (CO_2) into an underground oil zone can help boost production in a process called CO_2 enhanced oil recovery, or CO_2 EOR. If the injected CO_2 used for EOR comes from human activity, then the EOR process can help reduce our carbon footprint by putting the CO_2 into permanent storage deep underground.

An oil recovery project using CO_2 injection …

Denbury Onshore LLC (Denbury), a leader in CO_2 EOR operations, is implementing a commercial CO_2 EOR project that will add 20 plus years and 35 million barrels of oil to the life of the Bell Creek oil field in southeastern Montana. A 232-mile-long pipeline will deliver over 1 million tons of CO_2 a year from the Lost Cabin natural gas-processing facility in central Wyoming to the Bell Creek oil field. CO_2 injection for EOR is scheduled to start after the pipeline is completed in December 2012.

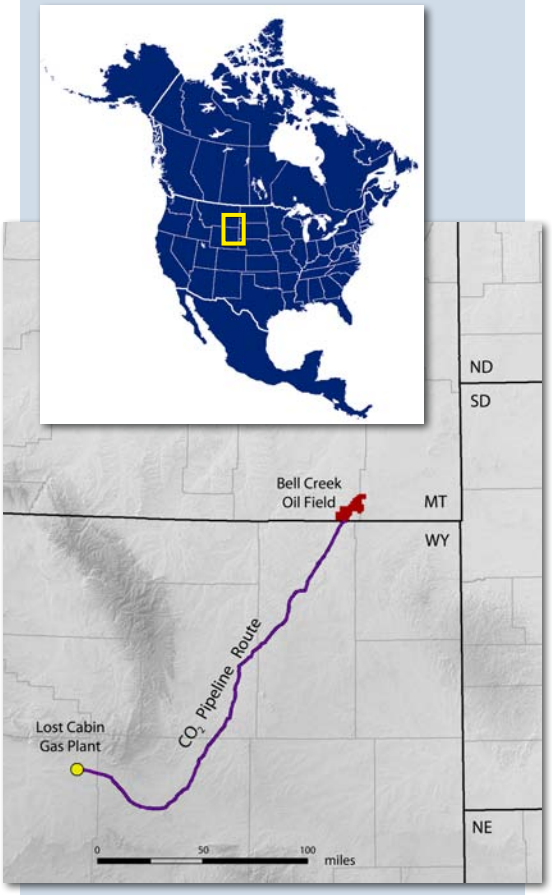
… combined with the innovative use of subsurface CO_2 modeling and monitoring systems …

Denbury has teamed with the Plains CO_2 Reduction Partnership, led by the Energy & Environmental Research Center, to characterize and model CO_2 behavior in the subsurface as a basis for designing a comprehensive monitoring plan for the CO_2 storage and EOR operation. Detailed site characterization, modeling, subsurface risk analysis, and monitoring of the CO_2 EOR and storage operations will allow site operators to account for the CO_2 utilized in oil production and to verify that the CO_2 remains in place once EOR operations are complete.

… to benefit the environment and the economy.

The integrated approach at the Bell Creek oil field helps meet the commonsense safety expectations of local landowners and communities. Further, by storing human-generated CO_2 at the Bell Creek oil field, Denbury benefits the environment by decreasing the carbon footprint of its regional oil field operation. The results of the Bell Creek project will help future projects effectively implement a proven CO_2 monitoring, verification, and accounting (MVA) system as part of a comprehensive approach to subsurface CO_2 management and EOR operations.

The Bell Creek Integrated CO_2 EOR and Storage Project combines the proven techniques of CO_2 EOR with the characterization and monitoring needed for effective carbon storage. The result is a new standard for safe and practical geologic CO_2 EOR to CO_2 storage operations.



CO_2 will be transported 232 miles by pipeline from the Lost Cabin gas-processing facility in central Wyoming to the Bell Creek oil field. At this point, CO_2 will be injected into the oil-bearing rock of the Muddy Formation sandstone.

Bell Creek Project Benefits

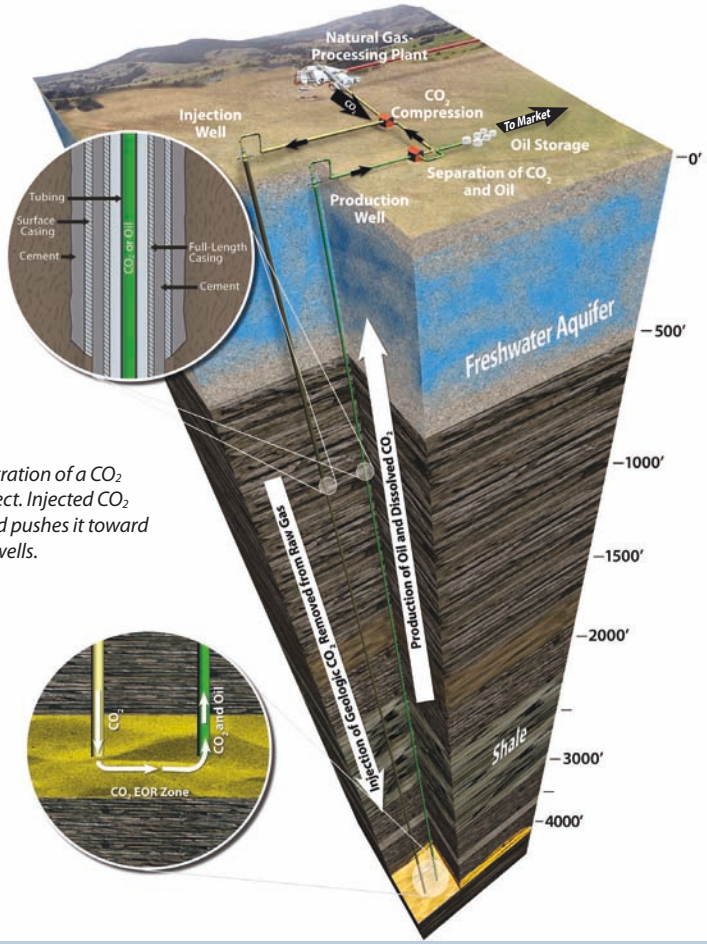
35 million barrels
of incremental oil

… millions of tons of CO_2 safely in storage

Natural Gas, Gas Processing, and Carbon Capture

When natural gas comes from the production well, it can contain impurities like CO_2 and hydrogen sulfide (H_2S), along with petroleum liquids like butane and propane. These constituents must be removed before the natural gas can be tied into a distribution pipeline or used by a customer. This cleanup is done at large facilities called natural gas-processing plants. There are more than 1300 natural gas-processing plants in the United States and Canada and nearly 1600 worldwide (PennWell, 2008, Worldwide gas-processing database). Because natural gas-processing plants are among the few sources of relatively pure streams of CO_2, they are good candidates for carbon capture and storage projects that feature geologic CO_2 storage—the permanent storage of CO_2 from human activities deep underground. The Bell Creek project will use the CO_2 produced at the Lost Cabin gas-processing plant in central Wyoming in a commercial CO_2 EOR to CO_2 geologic storage project that uses CO_2 from gas processing.

The Bell Creek oil field is located in southeastern Montana in the northern portion of the Powder River Basin. The oil is produced from sand bodies encased in shale at a depth of nearly a mile. These deep, isolated sands make ideal compartments for the safe long-term storage of CO_2 from human activities.



Simplified illustration of a CO_2 flood EOR project. Injected CO_2 thins the oil and pushes it toward oil-producing wells.

How CO_2 EOR to Storage Works

When CO_2 comes into contact with oil, a significant portion of the CO_2 dissolves into the oil, reducing oil viscosity and increasing the oil's mobility. This, combined with the increased pressure, can result in increased oil production rates as well as an extension of the operational lifetime of the oil reservoir.

In an oil field, this EOR method is called CO_2 flooding. CO_2 floods are designed to be active for decades. Over the years, there are many cycles of CO_2 injection. With each cycle, another portion of injected CO_2 becomes permanently trapped, or stored, in the oil reservoir. As a result of ongoing CO_2 EOR projects since the 1970s, hundreds of millions of tons of CO_2 is now permanently stored in oil fields.

The Bell Creek project brings this approach of integrated EOR storage and MVA to a pioneering project in the northern Great Plains.

The Plains CO_2 Reduction (PCOR) Partnership is a group of public and private sector stakeholders working together to better understand the technical and economic feasibility of storing CO_2 emissions from stationary sources in the central interior of North America. The PCOR Partnership is led by the Energy & Environmental Research Center (EERC) at the University of North Dakota and is one of seven regional partnerships under the U.S. Department of Energy's National Energy Technology Laboratory Regional Carbon Sequestration Partnership Initiative. To learn more, contact:

Charles D. Gorecki, Senior Research Manager, (701) 777-5355; cgorecki@undeerc.org

Edward N. Steadman, Deputy Associate Director for Research, (701) 777-5279; esteadman@undeerc.org

John A. Harju, Associate Director for Research, (701) 777-5157; jharju@undeerc.org

Visit the PCOR Partnership Web site at www.undeerc.org/PCOR. New members are welcome.

EERC Energy & Environmental Research Center® Putting Research into Practice

UND University of North Dakota Grand Forks

Sponsored in Part by the U.S. Department of Energy

NETL